

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Patent Application for:

Steven Teig, et al.

Serial No.: 10/061,641

Filing Date: 01/31/2002

For: INTERCONNECT LINES WITH NON-
RECTILINEAR POLYGONAL
TERMINATIONS

Examiner: Thuan V. Do

Group Art Unit: 2825

APPEAL BRIEF

COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This is an Appeal from the final rejection of claims 1-18 in the above-referenced application. In accordance with 37 C.F.R. § 41.37, this Appeal Brief, along with the accompanying Appendices, is accompanied by the required fee. Please charge any additional fees or credit any overpayment to Deposit Account No. **50-3804**.

I. REAL PARTY IN INTEREST

The real party in interest to this Appeal is Cadence Design Systems, a Delaware Corporation, having its principal place of business in San Jose, California.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences known to the Appellants, the Appellants' legal representative, or assignees thereof.

III. STATUS OF CLAIMS

Claims 1-18 are pending in the present application. The Examiner has rejected claims 1-18. Appellants hereby appeal the rejection of claims 1-18.

IV. STATUS OF AMENDMENTS

No amendments to the application were submitted after final rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

A. Independent Claim 1

Claim 1 recites an integrated-circuit (“IC”) layout. The IC layout includes a net with routable elements. *See e.g., Specification, page 18, lines 11-22.* The IC layout includes a first set of interconnect lines for connecting the routable elements of the net, where the interconnect lines have ends that are in the shape of partial non-quadrilateral polygons. *See e.g., Specification, page 99, line 2 to page 100, line 21.*

B. Dependent Claims

1. Dependent Claim 4

Claim 4 is dependent indirectly on claim 1. Claim 4 further recites partial polygons that are partial octagons, where the partial octagons are half-octagons. *See e.g., Specification, page 99, lines 7-8; see also e.g., Figure 63.*

2. Dependent Claim 7

Claim 7 is dependent indirectly on claim 1. Claim 7 further recites partial polygons that are partial hexagons, where the partial hexagons are half-hexagons. *See e.g., Specification, page 99, lines 9-10; see also e.g., Figure 64.*

3. Dependent Claim 11

Claim 11 is dependent indirectly on claim 1. Claim 11 further recites partial octagon ends of the interconnect lines are half-octagons. *See e.g., Specification, page 99, lines 7-8; see also e.g., Figure 63.*

4. Dependent Claim 14

Claim 14 is dependent indirectly on claim 1. Claim 14 further recites partial hexagon ends of the interconnect lines are half-hexagons. *See e.g., Specification, page 99, lines 9-10; see also e.g., Figure 64.*

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

I. The Examiner rejected claims 1-18 under 35 U.S.C. § 102(b) as being unpatentable over United States Patent 5,117,277, issued to Yuyama, et al. (“Yuyama”).

VII. ARGUMENT

The Examiner erred in rejecting the claims by misapplying standards under 35 U.S.C. § 102(b).

A. CLAIMS 1-18 ARE PATENTABLE UNDER 35 U.S.C. § 102 OVER YUYAMA. THE CITED REFERENCE DOES NOT DISCLOSE, TEACH, OR SUGGEST AN INTEGRATED CIRCUIT LAYOUT THAT INCLUDES INTERCONNECT LINES THAT HAVE ENDS THAT ARE IN THE SHAPE OF PARTIAL NON-QUADRILATERAL POLYGONS.

In rejecting claims 1-18 under 35 U.S.C. § 102, the Examiner states the following:

Yuyama teaches the connection pattern of the signal wirings in place of an IC layout that has a set of interconnect lines by connecting the routable elements of the net (col. 1, lines 12-22), and *the portions of a regular hexagonal shape* within one layer in place of the partial non-quadrilateral polygons by figures 1 & 6 and col. 8, lines 36-66 (the connection of portions of a regular hexagonal shapes can be seen in one layer of figure 1 and the lines with circular ending shape configurations are in figure 6).

(Office Action mailed February 23, 2006, page 3, emphasis added)

“A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). “The identical invention must be shown in as complete detail as is contained in the ... claim.” *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

In this case, the Appellants respectfully submit that the cited reference does not disclose, teach or suggest each and every element in the claims. Specifically, the Appellants respectfully submit that the cited reference does not disclose, teach or suggest an integrated circuit layout that includes a first set of interconnect lines for connecting the routable elements of the net, where the interconnect lines have ends that are in the shape of partial non-quadrilateral polygons.

Yuyama describes an integrated circuit device with signal wirings that have the shape of a dog-bone. *See* Yuyama, column 8, lines 11-12; *see* also FIG. 1. Yuyama describes these dog-bone shape signal wirings as having connection portions. *See* *Id.*, column 8, lines 13-14, 36-39; *see* also FIG. 1. Yuyama further describes these connection portions as having various shapes, such as a complete hexagon shape, a complete octagonal shape, or a complete polygonal shape. *See* *Id.*, column 8, line 22; *see* also column 12, lines 44-47. However, Yuyama does not describe, teach or suggest these shapes as partial shapes.

Appellants respectfully submit that Yuyama's connection portions that have the shape of a complete polygon is different than an interconnect line end that has the shape of a partial non-quadrilateral polygon. To illustrate this difference, Appellants have included two Exhibits, A and B.

Exhibit A illustrates marked-up connection portions 21A and 22A of Yuyama (sides labeled by Appellants). Specifically, Exhibit A illustrates the connection portions 21A and 22A with complete hexagonal shapes. This Exhibit clearly shows that Yuyama's connection portions have the shape of complete non-quadrilateral polygons. The connection portions illustrated in this Exhibit have the shape of a hexagon with six (6) sides, which have been labeled by the Appellants. A complete hexagon by definition includes six (6) sides. Therefore the hexagon shown is a complete hexagon by virtue of the fact that it has six (6) sides. In contrast, claim 1 recites interconnect lines

that have ends that are in the shape of partial non-quadrilateral polygons. Appellants respectfully submit that the shape of a complete non-quadrilateral polygon is not the same as the shape of a partial non-quadrilateral polygon.

Exhibit B illustrates examples of interconnect line ends that have the shape of partial non-quadrilateral polygons. None of the connection portions in Yuyama look like any of the interconnect line ends of Exhibit B. Therefore, Yuyama does not disclose, teach or suggest interconnect line ends that have the shape of partial non-quadrilateral polygons.

The Examiner states that Yuyama describes “*portions* of a regular hexagonal shape within one layer in place of the partial non-quadrilateral polygons.” *See* Office Action, page 3, emphasis added. However, Appellants respectfully submit that such a statement is an erroneous and improper interpretation of the term “portion” as used by Yuyama.

Yuyama does not use the term “portion” to indicate partial non-quadrilateral polygons, as stated by the Examiner. Instead, Yuyama uses the term “portion” in conjunction with the term “connection” to form the term “connection portion”. The term “connection portion” indicates a region of a signal wiring. For instance, the connection portion 21A is a region of the signal wiring 21. *See* Yuyama, column 8, line 36; *see* also FIG. 1. Appellants are unable to find a single instance in Yuyama where the term “portion” is used to qualify the meaning of the various shapes (e.g., hexagon), as alleged by the Examiner. Therefore, Appellants respectfully submit that the Examiner’s rejection relies entirely on an improper interpretation of Yuyama. Accordingly, Appellants respectfully submit that Yuyama does not render claims 1-18 unpatentable.

B. DEPENDENT CLAIMS 4 AND 11 ARE PATENTABLE UNDER 35 U.S.C. § 102 OVER YUYAMA. THE CITED REFERENCE DOES NOT DISCLOSE, TEACH, OR SUGGEST AN INTEGRATED CIRCUIT LAYOUT THAT INCLUDES INTERCONNECT LINES THAT HAVE ENDS THAT ARE IN THE SHAPE OF HALF-OCTAGONS.

As mentioned above, Yuyama describes an integrated circuit device with signal wirings that have the shape of a dog-bone. *See* Yuyama, column 8, lines 11-12; *see also* FIG. 1. Yuyama describes these dog-bone shape signal wirings as having connection portions. *See Id.*, column 8, lines 13-14, 36-39; *see also* FIG. 1. Yuyama further describes these connection portions as having various shapes, such as a complete hexagon shape, a complete octagonal shape, or a complete polygonal shape. *See Id.*, column 8, line 22; *see also* column 12, lines 44-47. However, Yuyama does not describe these shapes as half-octagons. Appellants respectfully submit that a complete octagonal shape is different than a half-octagon shape.

The use of interconnect lines that have ends that are in the shape of half-octagons is novel and non-obvious. For example, one advantage of interconnect lines that have ends that are in the shape of half-octagons is that they more closely model actual conductive lines in the IC's than traditional rectilinear interconnect-line ends. *See e.g.*, Specification, page 101, lines 2-4.

Accordingly, Appellants respectfully submit that Yuyama does not render claims 4 and 11 unpatentable.

C. DEPENDENT CLAIMS 7 AND 14 ARE PATENTABLE UNDER 35 U.S.C. § 102 OVER YUYAMA. THE CITED REFERENCE DOES NOT DISCLOSE, TEACH, OR SUGGEST AN INTEGRATED CIRCUIT LAYOUT THAT INCLUDES INTERCONNECT LINES THAT HAVE ENDS THAT ARE IN THE SHAPE OF HALF-HEXAGONS.

As mentioned above, Yuyama describes an integrated circuit device with signal wirings that have the shape of a dog-bone. *See* Yuyama, column 8, lines 11-12; *see also* FIG. 1. Yuyama describes these dog-bone shape signal wirings as having connection portions. *See Id.*, column 8, lines 13-14, 36-39; *see also* FIG. 1. Yuyama further describes these connection portions as having various shapes, such as a complete hexagon shape, a complete octagonal shape, or a complete polygonal shape. *See Id.*, column 8, line 22; *see also* column 12, lines 44-47. However, Yuyama does not describe these shapes as half-hexagons. Appellants respectfully submit that a complete hexagon shape is different than a half-hexagon shape.

The use of interconnect lines that have ends that are in the shape of half-hexagons is novel and non-obvious. For example, one advantage of interconnect lines that have ends that are in the shape of half-hexagons is that they more closely model actual conductive lines in the IC's than traditional rectilinear interconnect-line ends. *See e.g.*, Specification, page 101, lines 2-4.

Accordingly, Appellants respectfully submit that Yuyama does not render claims 7 and 14 unpatentable.

VIII. CLAIMS APPENDIX

See Claims Appendix A attached.

IX. EVIDENCE APPENDIX

Exhibit A illustrates enlarged and marked-up connection portions 21A and 22A of FIG. 1 in Yuyama (sides labeled by Appellants). The connection portions 21A and 22A have complete hexagonal shapes.

Exhibit B illustrates examples of interconnect lines that have ends in the shape of partial non-quadrilateral polygons, as shown in Figures 63 and 64 of the present application pplication.

X. RELATED PROCEEDINGS APPENDIX

There are no related appeals or interferences known to the Appellants, the Appellants' legal representative, or assignees thereof.

XI. CONCLUSION

In view of the foregoing, Appellants respectfully submit that the claims are patentable. Appellants hereby request that the Board overturn the Examiner's finding that the claims are unpatentable under 35 U.S.C. § 102.

Respectfully submitted,

Dated: July 28, 2006

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CLAIMS APPENDIX A

The following claims are the subject of this Appeal.

1. An integrated-circuit (“IC”) layout comprising:
 - a) a net with routable elements;
 - b) a first set of interconnect lines for connecting the routable elements of the net,wherein the interconnect lines have ends that are in the shape of partial non-quadrilateral polygons.
2. The IC layout of claim 1, wherein the partial polygons are partial octagons.
3. The IC layout of claim 2, wherein the partial octagons have several sides that are equal.
4. The IC layout of claim 3, wherein the partial octagons are half-octagons.
5. The IC layout of claim 1, wherein the partial polygons are partial hexagons.
6. The IC layout of claim 5, wherein the partial hexagons have several equal sides.
7. The IC layout of claim 5, wherein the partial hexagons are half hexagons.
8. The IC layout of claim 1 further comprising a first set of vias that are in the shape of the non-quadrilateral polygons.
9. The IC layout of claim 8, wherein the polygons are octagons.
10. The IC layout of claim 9, wherein the octagons have several sides that are equal.
11. The IC layout of claim 10, wherein the partial octagon ends of the interconnect lines are half octagons.
12. The IC layout of claim 8, wherein the polygons are hexagons.
13. The IC layout of claim 12, wherein the hexagons have several equal sides.
14. The IC layout of claim 13, wherein the partial hexagon ends of the interconnect lines are half hexagons.

15. The IC layout of claim 1 further comprising a first set of vias that are in the shape of another non-quadrilateral polygon.

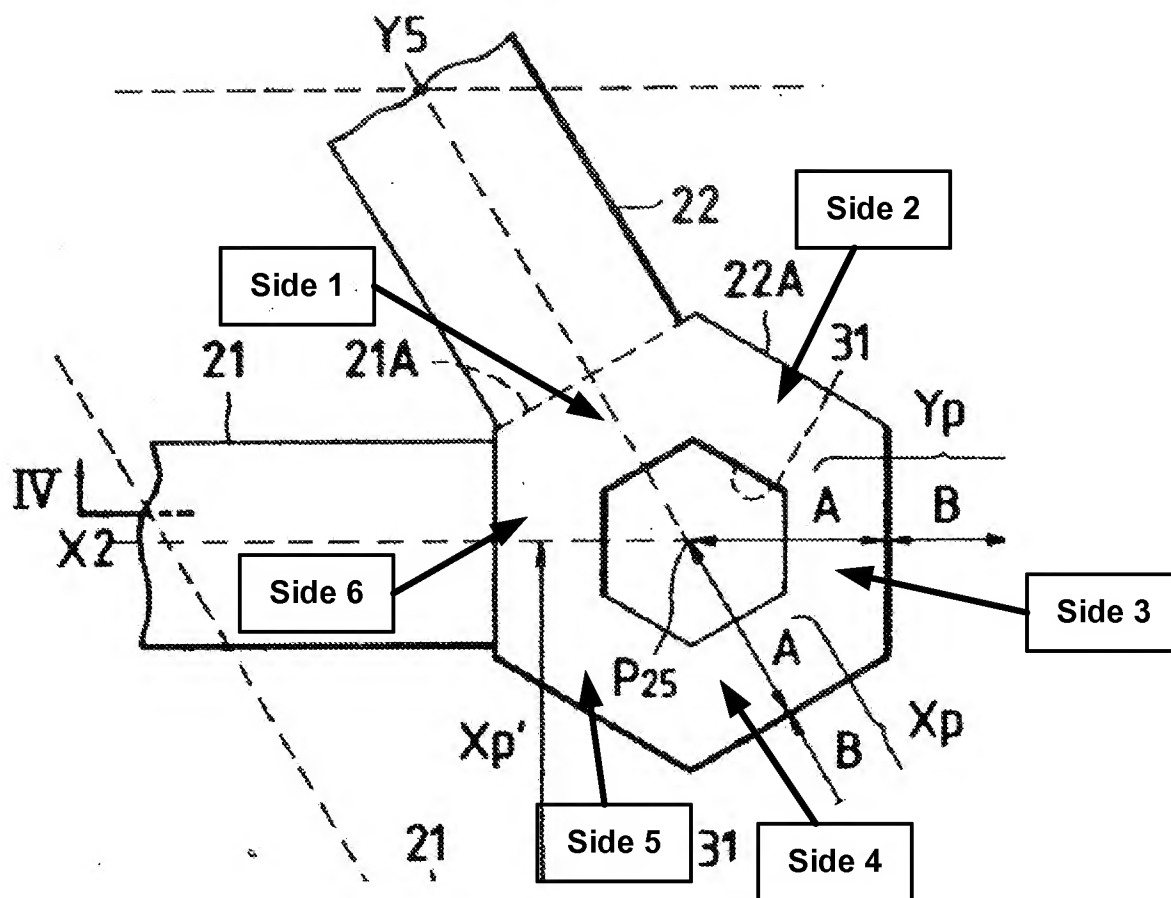
16. The IC layout of claim 1 further comprising a second set of interconnect lines that have ends that are in the shape of partial quadrilateral polygons.

17. The IC layout of claim 16, wherein the second set of interconnect lines have partial rectangular ends.

18. The IC layout of claim 16 further comprising a second set of vias that are in the shape of quadrilateral polygons.

EVIDENCE EXHIBIT A

Exhibit A illustrates enlarged and marked-up connection portions 21A and 22A of FIG. 1 in Yuyama (sides labeled by Appellants). The connection portions 21A and 22A have complete hexagonal shapes.



EVIDENCE EXHIBIT B

Exhibit B illustrates examples of interconnect lines that have ends in the shape of partial non-quadrilateral polygons, as shown in Figures 63 and 64 of the present application.

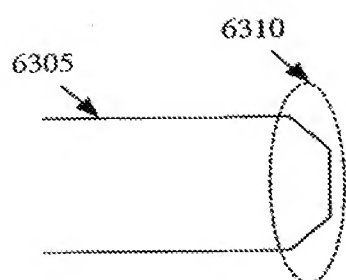


Figure 63

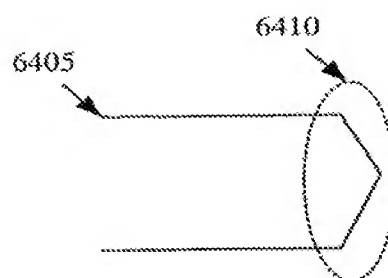


Figure 64